Integrating Land-Use Change Analysis and Ecological Risk Assessment

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Key Words: ecological risk assessment, land-use change, socioeconomic factors, water, geographic information systems

Nonpoint source pollution, containing excess sediments, nutrients, pathogens, or pesticides, accounts for a large portion of impacts to water quality. Streams and rivers are exposed to multiple stressors resulting from cumulative impacts of human activities. Many of these impacts stem from management practices and land-use change, such as rapid suburban development. EPA's Office of Water and the regions, states, and tribes are required to address nonpoint sources of pollution under Clean Water Act TMDL policy and stormwater regulations. Land-use/land-cover change also impacts brownfield redevelopment, air pollution, climate change, sustainable communities and environmental justice concerns. The social dimensions of environmental problems, a well-established tradition in social sciences such as geography, sociology, and anthropology, have not been emphasized in the risk assessment or regulatory community. Drawing on EPA's risk assessment framework, an approach is presented for integrating social dimensions of land-use/land-cover change with environmental analysis. Of concern is how to integrate social, economic, and landscape factors to provide an understanding of the spatial dimensions of risk to water quality. The poster will examine the forces leading to rapid land-use/land-cover change in suburban and rural areas of the Little Miami River Watershed in southwest Ohio. It will present a methodology for analyzing the relationship between socioeconomic factors (income, migration, growth in residential housing, and economic sector activity) and land-use patterns (urban, residential, agricultural, and forest) using Geographic Information Systems (GIS). The research illustrates how social factors and patterns of land-use/land-cover change can exacerbate or mitigate an area's susceptibility to environmental degradation. Spatial analysis of social and landscape variables in a GIS can aid in identifying (1) spatial patterns of land use, (2) social dimensions of land use/cover change, and (3) impacted populations and interested stakeholders. The results of the analysis will inform regions, states and tribes, watershed managers, and communities about the social causes of rapid urban growth and its risks to water quality. Further, these results aid decision-making and non-regulatory measures that strive for sustainable economic growth and protection of environmental resources.